

CLAIMS

1                   1.     A mouthguard to protect an arch of a user  
2     comprising:

3                         an outer wall covering a buccal surface a tooth, wherein  
4     said outer wall includes a force absorbing inner layer, a force absorbing  
5     outer layer and a force transmitting layer positioned therebetween said  
6     force absorbing inner layer and said force absorbing outer layer;

7                         an inner wall opposite said outer wall covering a palatal  
8     surface of the tooth, wherein said inner wall includes said force  
9     absorbing inner layer and said force absorbing outer layer; and

10                        a lower wall disposed between said outer wall and said  
11     inner wall covering an occlusal surface of the tooth, and said outer wall,  
12     inner wall and lower wall form a U-shaped channel that is molded in the  
13     shape of the arch, wherein said lower wall includes said force absorbing  
14     inner layer and said force absorbing outer layer.

1                   2.     A mouthguard as set forth in claim 1 wherein said  
2     force transmitting layer includes of a plurality of longitudinally extending  
3     fibers disposed in a resinous matrix.

1                   3.     A mouthguard as set forth in claim 1 further  
2     comprising a palate protective wall extending radially from an edge of  
3     said inner wall, wherein said palate protective wall conforms to a shape  
4     of a palate of the user.

1                   4.     A mouthguard as set forth in claim 1 wherein said  
2     force absorbing inner layer and force absorbing outer layer are made  
3     from a class of materials approved for dental use having resilient,  
4     moldable, and settable properties.

1                   5.     A mouthguard as set forth in claim 4 wherein said  
2     force absorbing inner layer includes a chemical additive enabling the  
3     material to be rigid below a first predetermined temperature and  
4     moldable above a second predetermined temperature that is greater  
5     than the first predetermined temperature.  
6

1                   6.     A mouthguard as set forth in claim 4 wherein said  
2     force absorbing inner layer material includes a gas-liberating chemical  
3     additive that is selected from a class of additives that is chemically  
4     reactive upon the application of heat to liberate air bubbles that become  
5     trapped in the force absorbing inner layer material.

1                   7.     A mouthguard as set forth in claim 1 wherein said  
2     force transmitting layer is made from a composite material selected from  
3     a class a materials approved for dental use having force transmitting  
4     properties.

1                   8.       A mouthguard as set forth in claim 7 wherein said  
2       composite force transmitting material includes a plurality of long fibers  
3       embedded in a resin matrix.

1                   9.       A mouthguard as set forth in claim 8 wherein said  
2       fibers are selected from a class of material that includes glass fibers, or  
3       carbon fibers or quartz fibers.

1                   10.      A mouthguard as set forth in claim 8 wherein said  
2       resin matrix is selected from a class of resinous materials including an  
3       epoxy resin, or a polyester resin or an acrylic resin.

1                   11.      A mouthguard as set forth in claim 7 wherein said  
2       force transmitting layer is formed as a strip.

1                   12.      A mouthguard as set forth in claim 11 wherein said  
2       strip is preformed.

1                   13.      A mouthguard to protect an arch of a user  
2       comprising:

3                   an outer wall covering a buccal surface a tooth, wherein  
4       said outer wall includes a force absorbing inner layer and a force  
5       absorbing outer layer made from a class of materials approved for  
6       dental use having resilient, moldable, and settable properties, and a

7 force transmitting layer positioned therebetween said force absorbing  
8 inner layer and said force absorbing outer layer made of a plurality of  
9 longitudinally extending fibers disposed in a resinous matrix;

10 an inner wall opposite said outer wall covering a palatal  
11 surface of the tooth, wherein said inner wall includes said force  
12 absorbing inner layer and said force absorbing outer layer; and

13 a lower wall disposed between said outer wall and said  
14 inner wall covering an occlusal surface of the tooth, and said outer wall,  
15 inner wall and lower wall form a U-shaped channel that is molded in the  
16 shape of the arch, wherein said lower wall includes said force absorbing  
17 inner layer and said force absorbing outer layer.

1 14. A mouthguard as set forth in claim 13 further  
2 comprising a palate protective wall extending radially from an edge of  
3 said inner wall, wherein said palate protective wall conforms to a shape  
4 of a palate of the user.

1 15. A mouthguard as set forth in claim 13 wherein said  
2 force absorbing inner layer includes a chemical additive enabling the  
3 material to be rigid below a first predetermined temperature and  
4 moldable above a second predetermined temperature that is greater  
5 than the first predetermined temperature.  
6

1                   16.    A mouthguard as set forth in claim 13 wherein said  
2    force absorbing inner layer material includes a gas-liberating chemical  
3    additive that is selected from a class of additives that is chemically  
4    reactive upon the application of heat to liberate air bubbles that become  
5    trapped in the force absorbing inner layer material.

1                   17.    A mouthguard as set forth in claim 13 wherein said  
2    fibers are selected from a class of fibrous material includes glass  
3    fibers, or carbon fibers or quartz fibers.

1                   18.    A mouthguard as set forth in claim 13 wherein said  
2    resin matrix is selected from a class of resinous materials including an  
3    epoxy resin, or a polyester resin or an acrylic resin.

1                   19.    A mouthguard as set forth in claim 13 wherein said  
2    force transmitting layer is formed as a strip.

1                   20.    A mouthguard as set forth in claim 19 wherein said  
2    strip is preformed.

1                   21.    A method of making a mouthguard for a user,  
2    said method including the steps of:  
3                    casting a model of a user's arch;

4                   molding a force absorbing inner layer of material to the  
5   model to form a force absorbing inner layer of the mouthguard;  
6                   molding a force-transmitting layer of material over the force  
7   absorbing inner layer in a predetermined position, wherein the force  
8   transmitting layer includes a plurality of longitudinally extending fibers  
9   disposed in a resinous matrix;  
10                  molding a force absorbing outer layer of material over the  
11   force absorbing inner layer and force transmitting layer to form a  
12   mouthguard having an inner wall covering a palatal surface of a tooth,  
13   an outer wall opposite inner wall covering a buccal surface of the tooth  
14   and a lower wall disposed therebetween the inner wall and outer wall  
15   covering an occlusal surface of the tooth; and  
16                  finishing the mouthguard to conform to the arch of the  
17   user.

1                  22. A method as set forth in claim 21 further comprising  
2   the step of using a sizing device to determine the size of mouthguard to  
3   use, wherein said sizing device includes a u-shaped bite member having  
4   a handle extending from an edge, and a plurality of arch shapes  
5   indicated on a surface of the bite member corresponding to a  
6   mouthguard size.

1                    23.     A mouthguard as set forth in claim 21 wherein said  
2     fibers are selected from a class of fibrous material including glass  
3     fibers, or carbon fibers or quartz fibers.

1                    24.     A mouthguard as set forth in claim 21 wherein said  
2     resin matrix is selected from a class of resinous materials including an  
3     epoxy resin, or a polyester resin or an acrylic resin.